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U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ANIMAL INDUSTRY—Circular No. 76.
D. E. SALMON, D. V. M., Chief of Bureau.

*See other sets for original issue
of no. 76, withdrawn & replaced by this.*



DAIRY METHODS

IN

GREAT BRITAIN,
IRELAND, DENMARK, HOLLAND, CHANNEL ISLANDS,
FRANCE, AUSTRIA-HUNGARY, GERMANY,
AND SWITZERLAND.

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[Reprint from Bulletin No. 77, Bureau of Animal Industry.]



WASHINGTON:
GOVERNMENT PRINTING OFFICE.

1905.

DAIRY CATTLE.

DAIRY METHODS IN GREAT BRITAIN AND IRELAND.

ENGLAND.

Cattle of the dairy breeds in England appear to be quite well fed. Guernseys and Jerseys, for example, are kept in much better condition than in their native islands. Young animals are usually better developed at the same age and mature ones are larger, and breeders do not seem to object seriously to flesh, especially on young stock.

FEEDING BREEDING STOCK.

Bull calves are raised in the usual manner by pail feeding, having whole milk for three or four weeks, and after that skim milk, roots, and hay, or skim milk, grain, and cake. Rations of equal parts whole milk and skim milk are fed on some farms. One very successful breeder feeds 6-months-old bulls on a ration of skim milk 20 pounds, flaxseed meal one-half pound (boiled and added to the milk), clover hay 5 pounds, sliced mangels 10 pounds, crushed oats 2 pounds, bran 1 pound, and linseed cake 1 pound.

Heifer calves are not fed so much grain and cake as bulls. They are bred from 15 months to 2 years of age.

Breeding bulls are maintained in low condition, and grain and cake are usually fed only to young bulls or mature ones doing heavy service. Feeds like corn meal, pea meal, bean meal, and ground barley are used sparingly and in conjunction with cooling feeds like roots and green forage. A great deal of exercise is given.

FEEDING DAIRY COWS.

The production of milk generally forms an important part of English farming operations, and dual-purpose cows are usually kept. The blood of the milking Shorthorn prevails in practically all parts of the country, and the special-purpose dairy breeds are more largely found on the estates of the wealthy classes and the nobility than on the farms of the small tenant farmers. The market value of the cows at the end of the milking period and the demand for calves from such cows for feeding exert an important influence in popularizing

the cows of the dual-purpose type. This condition of affairs, in a measure, has an influence on methods of feeding. As milk is not the only source of revenue for which cows are maintained, methods of feeding have not always received as close study from such farmers as is given the subject when dairy farming is conducted as a specialty. Mangels, carrots, white, yellow, and swede turnips, and cabbage are fed. Turnips are given in large quantities either before or after milking. In some private dairies, especially on large estates, which are run principally to supply the landlords' households, care is used to select feed which will not impart undesirable flavors to the milk, but in a large number of commercial dairies this discrimination is not exercised.

All feeders feed at least three times daily and many give six or seven feeds.

A few representative rations fed to milch cows in England are given below:

Farm No. 1.—This farm is located in Berkshire and is stocked with high-class Jersey cows, the milk from which is used to supply a fancy butter, cream, and milk trade. The rations fed are said by prominent dairymen to be the best in England.

During the summer each cow is fed daily, in addition to grass, 2 pounds of undecorticated cotton-seed cake, 3 pounds of wheat bran, and 8 pounds of clover hay. The daily winter ration is composed of 3 pounds crushed oats, 4 pounds wheat bran, 2 pounds cotton-seed cake, 2 pounds bean meal, 15 pounds mangels, 10 pounds cut hay, and 8 pounds long hay per head. The grain and cake are mixed with the cut hay, scalded, and fed in two feeds—one in early morning and the other in late afternoon; the roots are fed after milking in the morning and the long hay is fed after milking in the evening.

Ration for dairy cows fed in Berkshire, England.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	
Mixed hay.....	18	15.678	1.062	7.362	0.216	-----
Mangels.....	15	1.865	.165	.810	.015	-----
Bran.....	4	3.524	.488	1.568	.108	-----
Crushed oats.....	3	2.670	.276	1.419	.126	-----
Cotton-seed cake.....	2	1.836	.744	.338	.244	-----
Bean meal.....	2	1.714	.448	.986	.024	-----
-----		26.787	3.183	12.483	.733	1:4.44

Farm No. 2.—This farm is located in Cheshire, and is stocked with purebred milking Shorthorns. During the summer months each cow in full milk receives, in addition to grass, a daily grain mixture

composed of 2 pounds dried brewers' grains, 1 pound bran, 2 pounds undecorticated cotton-seed cake, and 1 pound of linseed cake. The fall and winter rations are composed of mixed hay, 15 pounds; oat straw, 7 pounds; swedes, 60 pounds; wet brewers' grains, 10 pounds; cotton-seed cake, 3 pounds; corn meal, 5 pounds, and wheat bran, 4 pounds. The cows receive both morning and evening a mixture of cut hay, pulped swedes, wet brewers' grains, and some bran, amounting in all to about 15 pounds at each feed, in the form of a scalded mash. The remainder of the swedes is fed in two feeds of about 25 pounds each, morning and evening. The straw is given at the last feed at night. The corn meal and cotton cake are mixed and fed in two equal feeds, morning and evening. About 8 pounds of long hay is fed as a midday feed, the remainder being cut and fed in conjunction with bran, swedes, and wet brewers' grains. From the standpoint of both milk production and the maintenance of a healthy condition of the cows the ration was satisfactory.

Ration for dairy cows fed in Cheshire, England.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	
Mixed hay	15	13.065	0.885	6.135	0.180	.....
Oat straw	7	6.356	.084	2.702	.056	.....
Swedes	60	6.000	.600	4.800	.120	.....
Wet brewers' grains	10	2.430	.390	.930	.140	.....
Cotton-seed cake	3	2.754	1.116	.507	.366	.....
Corn meal	5	4.455	.395	3.335	.215	.....
Wheat bran	4	3.524	.488	1.568	.108	.....
.....		38.584	3.958	19.977	1.185	1 : 5.73

Farm No. 3.—This farm is located in the county of Cumberland and carries a herd of 40 high-grade Shorthorn dairy cows. During the summer months no other feed than pasture is furnished. The winter ration is different from that seen on any other farm visited, and produces a good flow of milk. All of the feeding stuffs, with the exception of the cake, are grown on the farm. The daily feeding per head is as follows: At 5 a. m., 4 pounds cut sheaf oats, 7 pounds pulped swedes, 1½ pounds cotton-seed cake, and 1½ pounds linseed cake, all mixed together before feeding; 7 a. m., 14 pounds of whole swedes and 7 pounds of long mixed hay; 9 a. m., 7 pounds of the same mixture which was fed at 5 a. m.; 10 a. m., 7 pounds long hay; 12 m., 3½ pounds long hay; 2.30 p. m., same as at 5 a. m.; 4 p. m., 14 pounds whole swedes; 7 p. m., 7 pounds of cabbage and 7 pounds long hay. The cows are watered twice a day, at 8 a. m. and 3 p. m.

Ration for dairy cows fed in Cumberland, England.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	
Mixed hay	24.5	21.340	1.446	10.021	0.294	-----
Swedes	45.5	4.550	.455	3.640	.090	-----
Sheaf oats	10	9.110	.430	4.640	.150	-----
Cotton-seed cake	3.75	3.443	1.395	.634	.458	-----
Linseed cake	3.75	3.405	1.099	1.226	.263	-----
Cabbage	7	1.071	.126	.574	.028	-----
	-----	42.919	4.951	20.735	1.283	1 : 4.77

Farm No. 4.—This farm is located in Norfolk and is stocked with one of the largest herds of Red Polled cows to be found in England. During the summer months all cows which have not been in milk seven months are fed a mixture of undecorticated cotton cake and linseed cake, in addition to the grass. The amount fed varies from 3 to 5 pounds per cow per day. The winter rations are composed of mixed hay, roots, and a grain mixture of crushed oats, wheat bran, linseed cake, and cotton cake. While some turnips are fed during the fall months, mangels are relied upon very largely to furnish succulent feed during the winter. The ration fed in January to cows in full milk was composed of mixed hay, 20 pounds (10 pounds of which was cut and mixed with pulped mangels and grain); mangels, 60 pounds; crushed oats, 3 pounds; bran, 3 pounds; linseed cake, 3 pounds, and cotton-seed cake, 3 pounds. The cows were fed a mixture of cut hay, pulped mangels, and half of the grain and cake in the early morning and before milking in the evening. The long hay was fed at noon and night, while the roots were fed at 8 a. m. and 3 p. m.

Ration for dairy cows fed in Norfolk, England.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	
Mixed hay	20	17.420	1.180	8.180	0.240	-----
Mangels	60	5.460	.660	3.240	.060	-----
Crushed oats	3	2.670	.276	1.419	.126	-----
Wheat bran	3	2.643	.366	1.176	.081	-----
Linseed cake	3	2.724	.879	.981	.210	-----
Cotton-seed cake	3	2.754	1.116	.507	.366	-----
	-----	33.671	4.477	15.503	1.083	1 : 4.00

SCOTLAND.

FEEDING BREEDING ANIMALS.

The breeding of dairy cattle is confined almost solely to the southwest of Scotland, where the Ayrshire breed is maintained. As the

land surface is rather rough and broken the conditions are not favorable for roots or grain crops. The cattle are grazed during the summer and maintained largely on hay and grain during the winter. Straw is fed, but not to the same extent as in the grain-growing districts. Roots are fed by some farmers, but their use is limited when compared with the methods prevailing in central and northern Scotland. The aim of breeders throughout the entire district is to maintain their animals as economically as possible. While they are warmly housed during the coldest months, the grazing season is much longer than that of the more highly arable sections of the country. Calves are raised in the usual way, having whole milk for two or three weeks, and then milk or sweet whey and grain until they are 6 to 10 months old. Bulls and heifer calves are fed the same way until they are 12 months of age, after which the bulls are confined and fed more grain and cake than the heifers, the latter being on pasture as much as possible.

On the farm of one of the most successful breeders of Ayrshire cattle the calves are fed during the winter on timothy hay, roots, and a grain mixture composed of equal parts crushed oats, wheat bran, and linseed cake. At the time of the writer's visit in January the calves, ranging in age from 9 to 13 months, were eating on an average 10 pounds of hay, 15 pounds of turnips, and 4 pounds of the grain and cake mixture per day. On other farms no roots are fed and oat straw is given as part of the roughage. The breeding bulls are not maintained in very high condition. Their winter rations are composed of roughage, grain and roots when they are grown. During the summer a great deal of green feed is fed.

FEEDING DAIRY COWS.

Scotch farmers do not patronize creameries and cheese factories, butter and cheese being made on the farms where the milk is produced. The men who furnish milk to the city dealers do not as a rule milk a cow more than ten or twelve months. They are continually buying fresh milking cows, largely of Shorthorn breeding, from the northern counties of England, and are selling out of their stables for beef cows which have been very heavily fed throughout the entire milking period and for the succeeding four or five months. Young cows which have dropped their second or third calves are used, as they milk well, fatten readily, and return the greatest profits for the feed consumed.

Dairymen who retain their cows for several years do not feed so heavily. The cows are fairly well fed during the first five months of lactation, and the amount of grain and cake is then reduced or omitted entirely. They believe that this method of feeding gives

the cow a chance to rest, and her period of usefulness as a breeder and milker is therefore very much longer than when heavily fed on grain and cake.

In the dairies from which the city milk trade is supplied feeders use large quantities of turnips and swedes—as much as 100 pounds per cow being fed daily—and no precautions are taken in regard to the time of feeding them. The stables are hot, without any provision for ventilation. These methods do not prevail on farms where butter and cheese are manufactured. Here a great deal of care is exercised to avoid injuring the flavor or texture of the finished product by improper feeding. Some dairymen cut a great deal of the hay and straw and mix all the grain and cake with it, and either steam or scald it before feeding. On other farms part of the roughage is cut, mixed with pulped turnips, grain, and cake, and allowed to stand twelve or fifteen hours before being fed. The cows are fed from four to nine times per day.

The following rations are fairly representative:

Farm No. 1.—This farm is located within 2 miles of Edinburgh, and the methods of feeding are representative of those practiced by the men who feed their cows heavily for about ten or twelve months and then sell them to the butcher. The herd contained 56 cows, nearly all of which were English-bred Shorthorns from Cumberland. The winter ration for cows in full milk was composed of 100 pounds of turnips, fed in three feeds—morning, noon, and night; 70 pounds of wet brewers' grains, 5 pounds of pea meal, and 10 pounds of oat straw. The pea meal was fed with the wet brewers' grains, which were given in two feeds, one in the early morning and the other about 5 p. m. The oat straw was fed at night.

Ration for dairy cows fed near Edinburgh, Scotland.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	
Turnips	100	9.500	1.000	7.200	0.200	
Wet brewers' grains	70	17.010	2.730	6.510	.980	
Oat straw	10	9.080	.120	3.860	.080	
Pea meal	5	4.475	.840	2.590	.035	
		40.065	4.690	20.160	1.295	1 : 4.92

Farm No. 2.—This farm is located in the county of Ayr, and on it is maintained a herd of 70 cows. The milk is used for cheese making. During the summer the cows receive a grain mixture of 2 pounds bean meal, 2 pounds wheat bran, and 1 pound crushed oats. The winter ration is composed of timothy hay, 15 pounds; oat chaff, 5 pounds; crushed oats, 3 pounds; wheat bran, 3 pounds; linseed cake, 2 pounds, and bean meal, 4 pounds. The hay is fed in three feeds—

morning, noon, and night; the grain is mixed with the oat chaff and fed in two feeds—morning and evening.

Ration for dairy cows fed in Ayrshire, Scotland.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	
Timothy hay	15	13.020	0.420	6.510	0.210	.....
Oat chaff	5	4.285	.975	1.650	.035	.....
Crushed oats	3	2.670	.276	1.419	.126	.....
Wheat bran	3	2.643	.366	1.176	.081	.....
Linseed cake	2	1.816	.586	.654	.140	.....
Bean meal	4	3.428	.896	1.972	.048	.....
-----		27.862	2.619	13.381	.640	1:5.16

Farm No. 3.—This farm is located in Perthshire, near the city of Perth. The milk supplies the city trade. The herd contains 40 cows, and instead of selling them off at the end of the milking period the owner breeds them to a good purebred Aberdeen-Angus bull, and the calves when dropped are eagerly sought for at good prices by cattle feeders, who rear them on nurse cows.

The winter ration is oat straw, 12 pounds; turnips, 100 pounds; wet brewers' grains, 20 pounds; linseed cake, 2 pounds; ground barley, 3 pounds; wheat bran, 4 pounds, and bean meal, 3 pounds. The straw is fed in two feeds, the turnips in three feeds, and the wet brewers' grains and the grain and cake mixed in two equal feeds.

Ration for dairy cows fed in Perthshire, Scotland.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	
Turnips	100	9.500	1.000	7.200	0.200	.....
Wet brewers' grains	20	4.860	.780	1.860	.280	.....
Oat straw	12	10.896	.144	4.632	.096	.....
Linseed cake	2	1.816	.586	.654	.140	.....
Ground barley	3	2.673	.261	1.968	.048	.....
Wheat bran	4	3.524	.488	1.568	.108	.....
Bean meal	3	2.571	.672	1.479	.066	.....
-----		35.840	3.931	19.361	.908	1:5.44

Farm No. 4.—This farm is located in the county of Lanark and maintains a herd of 25 cows. Butter making is its specialty. During the summer the cows are fed equal parts of crushed oats, wheat bran, and dried brewers' grains, in addition to grass. The amount varies from 4 to 7 pounds per cow per day, according to the condition of the pastures. The winter ration includes 20 pounds of mixed hay, 20 pounds of turnips, 3 pounds bean meal, 2 pounds pea meal, 3 pounds wheat bran, and 3 pounds of ground barley. The turnips are

fed immediately after milking in the morning and before the cows are let out in the fresh air for exercise.

Ration for dairy cows fed in Lanarkshire, Scotland.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	
Mixed hay	20	17.420	1.180	8.180	0.240	-----
Turnips	20	1.900	.200	1.440	.040	-----
Bean meal	3	2.571	.672	1.479	.036	-----
Pea meal	2	1.790	.336	1.036	.014	-----
Wheat bran	3	2.643	.366	1.176	.081	-----
Ground barley	3	2.673	.261	1.968	.048	-----
	-----	28.997	3.015	15.279	.459	1:5.41

IRELAND.

The dairy industry is of great importance in Ireland. Although all Irish farmers are more or less engaged in milk production, those of the south of Ireland devote practically all of their attention to dairying. The cows drop their calves in the early spring and are milked until late in the fall, as long as the grass lasts, and are then dried off. During the winter they are fed on rather scanty rations, such as oat straw, the run of a grass lot, and occasionally some hay. On some farms the cows are comfortably housed during the winter and well fed. In the central and northern districts cows are given much better care and feed during the winter. Grass is the staple feed in summer in all parts of the country. In the province of Ulster, especially in County Down, some dairy farmers feed a small allowance of cotton cake in addition to grass.

The following rations illustrate the methods on the best farms in central and northern Ireland:

Farm No. 1.—This farm is in county Kildare, near the city of Dublin, and the milk supplies the city trade. Ration: Mixed hay, 10 pounds; clover hay, 10 pounds; mangels, 30 pounds; crushed oats, 3 pounds; ground barley, 3 pounds; linseed cake, 2 pounds.

Ration for dairy cows fed in County Kildare, Ireland.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	
Mixed hay	10	8.710	0.590	4.090	0.120	-----
Clover hay	10	8.470	.680	3.580	.170	-----
Mangels	30	2.730	.330	1.620	.030	-----
Crushed oats	3	2.670	.276	1.419	.126	-----
Ground barley	3	2.673	.261	1.968	.048	-----
Linseed cake	2	1.816	.586	.654	.140	-----
	-----	27.069	2.723	13.331	.634	1:5.4

Farm No. 2.—This farm is located in County Antrim, in the province of Ulster. The milk supplies a city trade. The herd consists of 40 high-grade Shorthorns. Ration: Mixed hay, 20 pounds; turnips, 30 pounds; crushed oats, 3 pounds; corn meal, 3 pounds; wheat bran, 2 pounds, and cotton-seed cake, 2 pounds.

Ration for dairy cows fed in County Antrim, Ireland.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	
Mixed hay	20	17.420	1.180	8.180	0.240	-----
Turnips	30	2.850	.300	2.160	.060	-----
Crushed oats	3	2.670	.276	1.419	.126	-----
Corn meal	3	2.673	.237	2.001	.129	-----
Wheat bran	2	1.762	.244	.784	.064	-----
Cotton-seed cake	2	1.836	.744	.338	.244	-----
	-----	29.211	2.981	14.882	.853	1:5.64

Farm No. 3.—This is a large farm in County Down, province of Ulster. Ration: Clover hay, 15 pounds; oat straw, 6 pounds; ground barley, 5 pounds; wheat bran, 2 pounds, and linseed cake, 3 pounds. The grain is scalded with hot water and fed in two feeds. The hay is given night and morning and the straw at noon.

Ration for dairy cows fed in County Down, Ireland.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	
Clover hay	15	12.705	1.020	5.370	0.255	-----
Oat straw	6	5.448	.072	2.316	.048	-----
Ground barley	5	4.455	.435	3.280	.080	-----
Wheat bran	2	1.762	.244	.784	.064	-----
Linseed cake	3	2.724	.879	.981	.210	-----
	-----	27.094	2.650	12.731	.647	1:5.86

DAIRY FARMING IN DENMARK.

Denmark is preeminently a dairy country and the cattle interests are all centered on the production of milk. More than a quarter of a century ago beef production was extensively carried on, but it is now a thing of the past. Keen competition in the world's markets, due to improved transportation facilities, drove the Danish farmer out of the beef business and caused him to devote his attention to dairying. This change has had a wonderful influence on the type of cattle bred within the country. The two native breeds, the Red Danish and the Jysk (or Jutland breed), both of which were formerly used for beef, have been so markedly changed by a judicious system of breeding, feeding, and selection that they now rank among the foremost breeds of dairy cattle. The aim and purpose of the farmers in

all parts of Denmark is to keep the greatest number of high-class dairy cows possible on a given area of ground. When we take into consideration the light nature of the soil, its northern location, and the more limited scope of vegetation, we must admit that the farmers of Denmark, as a whole, have advanced and developed dairy farming in a measure that is certainly not equaled or even approached by that of any other country. At the present time the average Danish farmer maintains about one cow for every two and a third acres of land in his farm, and in addition grows enough young cattle to replace any cows which are discarded from time to time on account of age or accident. All calves, except those from the best cows and intended for breeding purposes, are sold for veal when but a few weeks old.

It is the prevailing custom to stable the cows about eight months out of each year and green forage is fed during the remaining four months. Although about one-seventh of each farm is devoted to grass, cattle are seldom allowed free access to it. In some instances this grass is cut and fed to the cows in stables or open paddocks. The most prevalent practice, however, is to tether them in rows and allow them a new feeding ground each day. This allows each strip of land several days' rest, and much more feed is obtained from a given area of ground than would otherwise be possible.

The cows receive green forage or concentrated feed, or both. The grass lot is also useful to afford a means of supplying exercise and fresh air, and some farmers, who do not set aside land for grazing, have open paddocks adjoining the stables, where the cows spend several hours each day.

A great deal of attention is given to the study of feeding, and very accurate records are kept of the amount of feed consumed and the milk and butter fat produced. By means of these records the inferior cows can be weeded out of a herd and the average yield increased. To aid the small farmers in this work the Royal Danish Society has established a system of "Kontrol" societies all over the country. The system is as follows: The farmers of a district form a cooperative society for the purpose of securing a "Kontrol" inspector from the Royal Danish Society to take charge. Before such an inspector will be appointed there must be about 1,000 cows represented by the local membership. To defray part of the expenses of the work each member is assessed a small amount, which varies in different societies from 26 cents to 53 cents per cow, according to the number of cows and the character of the work to be done. The "Kontrol" inspector makes an inspection of each farm about once every eighteen days, and keeps a set of books with each farm in duplicate, one set being retained by the farmer. Among other things,

he records the total amount of milk produced by each cow since his last visit (the milk being regularly weighed and entered in a special book by the farmer); the percentage of fat contained in the daily samples of the milk; a calculation of the butter produced; the amount of feed eaten per cow; the amount of butter produced in relation to the amount of feed consumed; the total amount of milk per cow per annum, its cost, and the net profit per cow. He advises concerning the selection of bulls for the different cows, the kinds of crops to grow, and any changes which would be beneficial in the rations, and recommends the disposal of all cows which have not returned a profit on the feed consumed. This system has done a great deal of good and its cost is very small. With some societies the average annual yield of milk per cow has increased 1,000 pounds in less than four years from the time they were first started. This increase has been due largely to better methods of feeding and more careful selection of the cows in the herd.

The Danish farmers fully appreciate the advantages of this system and hope for still greater improvements. Every precaution is taken which will in any way have a favorable influence on the yield of milk. The stables are well ventilated, so that their winter temperature is about 60° F. On many farms the cows are groomed twice or three times weekly.

BREEDING CATTLE.

Under this head only the methods of feeding young cattle and breeding bulls will be considered. All breeding cows are kept for milk production and are fed for that purpose; methods of feeding them will be discussed in that connection.

Much care is given to the feeding of breeding bulls, and the Danish farmers aim to retain all sires which get good stock until they are 10 or 12 years of age or as long as they prove sure stock getters. Under the Danish system a bull is not eligible to registration until he is at least 3 years old and has proved himself a useful sire. These people have many sensible ideas regarding the management of their animals. A bull is not purchased or rejected on his general appearance, but the quality and productive powers of his stock determine his value in the market.

The grain part of the ration is usually crushed oats and bran or ground barley and bran. Bulls are not fed cotton-seed, sunflower, or rape-seed cake, but linseed cake is sometimes used. Roots are given during the fall and winter months.

THE FEEDING OF DAIRY COWS.

The feeding of dairy cows is a vital question in Denmark. Everything grown on the farm is utilized to the very best advantage possible and is supplemented by a large amount of imported concentrated feed.

A variety of soiling crops is grown on each farm. The first in season is winter rye, which is ready for cutting in May. Next follow the clovers, then the various cereal crops, such as oats and barley and other mixtures. Vetches, peas, and other forms of leguminous crops are also grown to some extent and are very highly prized. These crops are allowed to reach a fair degree of maturity before being used. Root crops, especially mangels and beets, are very generally grown.

When cows are tethered during the summer they are fed moderate quantities of green forage or concentrated feed, or both, in addition to grass.

The following rations are representative of feed during the summer season :

Farm No. 1.—This is a rather large farm near Bregentved. The cows are tethered for several hours each day on a grass lot. The grain ration consists of 3 to 6 pounds per cow per day of a mixture of 2 parts cotton cake, 1 part ground barley, and 1 part wheat bran. The earliest green feed is winter rye. Later on clover is used, followed by a mixture of oats, barley, and vetches sown at different intervals.

In the early fall roots are used. The amount of fodder fed varies from 30 to 60 pounds per day, according to the condition of the grass lots.

Farm No. 2.—This is a small-sized farm located in the vicinity of Horsens. The cows are grazed on a grass lot for several hours each day and confined to the stables or yards the remainder of the time. The soiling crops are winter rye, clover, mixed grasses, oats and barley, vetches and roots. The forage is fed in the morning and after milking in the evening. In addition, from 2 to 4 pounds of cotton cake are fed each cow daily.

Farm No. 3.—This farm is located near Kolding, in the south of Jutland, and consists of some 18 acres. By using rather large amounts of concentrated feed the owner is able to keep 10 cows. No land is set aside for grazing, the cows being stabled, with the exception of a few hours daily in an open paddock for exercise. For soiling winter rye, clover, mixed grass and clover, peas, oats and barley, and roots are used. The concentrated feed is composed of cotton cake 2 parts, dried brewers' grains 2 parts, and ground barley 1 part, and from 5 to 7 pounds is fed daily in two equal feeds, morning and evening.

During the winter cows are confined practically all of the time in warm stables, and are usually fed three times daily. As a rule, all grain is crushed or ground, but little labor is expended on the preparation of feed.

The following rations illustrate the general methods of winter feeding.

Farm No. 1.—This is a very large farm, near Bregentved, where between 180 and 200 cows are milked. During the winter the cows are confined to the stalls most of the time, and a supply of fresh water is always before them. The roughage is clover or mixed hay, oat or barley straw, the combination in most general use being 12 pounds clover hay and 8 pounds of oat straw. The hay is fed morning and night and the straw at noon. About 20 pounds of mangels are fed each morning and evening. The grain ration is crushed oats 2 pounds, ground barley 2 pounds, cotton-seed cake 2 pounds, and bean meal 2 pounds, fed in two equal feeds, morning and evening.

Ration for dairy cows fed near Bregentved, Denmark.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	
Clover hay	12	10.164	0.816	4.206	0.204	-----
Oat straw	8	7.264	.096	3.088	.064	-----
Mangels	40	3.640	.440	2.160	.040	-----
Crushed oats	2	1.780	.184	.946	.084	-----
Barley meal	2	1.782	.174	1.312	.032	-----
Cotton-seed cake	2	1.836	.744	.938	.244	-----
Bean meal	2	1.714	.448	.986	.024	-----
-----		28.180	2.902	13.126	.692	1:5.06

Farm No. 2.—This is a large farm near Hasler, and the owner maintains about 100 cows. Complete records are kept of all the feed consumed and milk produced. The stables are very warm, but the cows are out a few hours each fine day in an open court. About 14 pounds of mixed hay, about 6 pounds of barley straw, and 30 pounds of mangels per cow per day are fed. The grain ration consists of ground barley 3 pounds, cotton-seed cake 3 pounds, and wheat bran 2 pounds. The hay is fed morning and night, the straw at noon, the roots in two feeds—late morning and about 5 o'clock in the afternoon—and the grain in two equal feeds, morning and night.

Ration for dairy cows fed near Hasler, Denmark.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	
Mixed hay	14	12.194	0.826	5.726	0.168	-----
Barley straw	6	5.148	.042	2.472	.036	-----
Ground barley	3	2.673	.261	1.968	.048	-----
Cotton-seed cake	3	2.754	1.116	.507	.336	-----
Wheat bran	2	1.762	.244	.784	.054	-----
Mangels	30	2.730	.330	1.620	.030	-----
-----		27.261	2.819	13.077	.672	1:5.18

Farm No. 3.—This is a medium-sized farm in the vicinity of Roskilde, and is considered to be fairly representative of the average farm of Denmark. The ration consisted of mixed hay 15 pounds, oat straw 6 pounds, mangels 30 pounds, and a grain mixture of crushed oats 2 pounds, ground barley 2 pounds, dried brewers' grains 2 pounds, and rape-seed meal 2 pounds.

Ration for dairy cows fed near Roskilde, Denmark.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	
Mixed hay.....	15	13.065	0.885	6.135	0.180	-----
Oat straw.....	6	5.448	.072	2.316	.048	-----
Mangels.....	30	2.730	.330	1.620	.030	-----
Crushed oats.....	2	1.780	.184	.946	.084	-----
Ground barley.....	2	1.782	.174	1.312	.032	-----
Dried brewers' grains.....	2	1.836	.314	.728	.102	-----
Rape-seed meal.....	2	1.800	.504	.474	.150	-----
-----		28.441	2.463	13.529	.626	1: 6.06

Farm No. 4.—This is a small farm near Lyngby, where the owner keeps fourteen cows on 30 acres. The stables are warm and well ventilated; water is constantly in front of the cows. Ration: Clover hay, 14 pounds; oat straw, 6 pounds; ground barley, 3 pounds; sunflower-seed cake, 3 pounds; wheat bran, 2 pounds; carrots, 30 pounds.

Ration for dairy cows fed near Lyngby, Denmark.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	
Clover hay.....	14	11.858	0.952	5.012	0.238	-----
Oat straw.....	6	5.448	.072	2.316	.048	-----
Ground barley.....	3	2.673	.261	1.968	.048	-----
Sunflower-seed cake.....	3	2.754	.936	.588	.384	-----
Wheat bran.....	2	1.762	.244	.784	.054	-----
Carrots.....	30	3.420	.240	2.340	.060	-----
-----		27.915	2.705	13.008	.832	1: 5.49

While in the city of Copenhagen the writer inspected the methods of the Copenhagen Milk Supply Company, which is owned and operated by people of the city, who contract with farmers. This organization has exacting regulations. No farmer furnishing milk to it is allowed to feed brewers' grains or any distillery refuse. He must not feed turnips, turnip leaves, nor more than 30 pounds per cow per day of either carrots or mangels. Furthermore, no cake, except rape-seed cake, can be used, and the use of that is limited to 1½ pounds per cow per day, and may be fed only when at least 5 pounds of a mixture of oats, barley, and bran are fed with it. Stable

feeding of cows in the summer is not permitted under any circumstances. They must be fed in the open air, in yards, or pastured in a grass lot. The feeding of vetches is also forbidden. In addition to the general trade, there is a special demand for milk for infants. For this purpose the milk from certain farms only is used. All the restrictions which apply to the general trade are enforced on these farms, and in addition the following must be strictly observed: Except of carrots limited to 15 pounds per cow per day, no roots can be fed and no cake can be used under any circumstances. These restrictions increase the cost of production, but this is counterbalanced by the additional compensation, as the prices are very much in advance of those obtained for ordinary milk.

In addition to this company, a similar organization has been recently established by cow owners for the same purpose. On some of the farms which were supplying the general trade the cows, instead of being grazed all the time during the summer season, were fed partially on soiling crops. These crops were fed in open feed lots and not in the stables. On one farm, which was supplying milk for infants, the cows were grazed all the time and milked in the pasture lot. In addition to the grass they received about 4 pounds per cow per day of a mixture of equal parts of crushed oats and wheat bran.

The following winter ration is used on a farm supplying the general milk trade: Mixed hay, 15 pounds; oat straw, 5 pounds; mangels, 30 pounds; crushed oats, 2 pounds; ground barley, 2 pounds; wheat bran, 2 pounds; rape-seed cake, 1½ pounds. The hay is fed in two feeds, morning and night, the straw at noon, the mangels in two feeds, after milking in the morning and before milking in the evening, and the grain in two feeds, at milking time, morning and evening.

Ration for dairy cows supplying the Copenhagen milk trade, Denmark.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	
Mixed hay.....	15	13.065	0.885	6.135	0.180	-----
Oat straw.....	5	4.540	.060	1.930	.040	-----
Crushed oats.....	2	1.780	.184	.946	.064	-----
Ground barley.....	2	1.782	.174	1.312	.082	-----
Wheat bran.....	2	1.762	.244	.784	.054	-----
Rape-seed cake.....	1½	1.350	.378	.356	.113	-----
Mangels.....	30	2.730	.330	1.620	.030	-----
	-----	27.009	2.255	13.083	.533	1:6.81

On a farm where milk is produced for infants the following winter ration is in use: Clover hay, 16 pounds; oat straw, 6 pounds; crushed oats, 3 pounds; ground barley, 2 pounds; wheat bran, 5 pounds; carrots, 15 pounds. The feed is fed in the stable, but the cows are

turned out in an open lot for a few hours each day, weather permitting.

Ration for dairy cows supplying milk for infants, Denmark.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	
Clover hay	16	13.552	1.088	5.728	0.272	-----
Oat straw	6	5.448	.072	2.316	.048	-----
Crushed oats	3	2.670	.276	1.419	.126	-----
Ground barley	2	1.782	.174	1.312	.062	-----
Wheat bran	5	4.405	.610	1.960	.135	-----
Carrots	15	1.710	.120	1.170	.060	-----
	-----	29.567	2.340	13.905	.643	1:6.57

FEEDING METHODS IN HOLLAND.

Dairying is the most important branch of farming in Holland. The entire country is densely stocked with the native black-and-white cattle which in America are designated as the Holstein-Friesian breed. It is a strictly grazing country and has many natural advantages for live-stock production. The rich soil and moist climate insure an abundance of grass and a plentiful hay crop. Root crops also do unusually well. Of the cereals oats are the most commonly grown, but wheat and barley are both grown in considerable quantities.

BREEDING CATTLE.

The Dutch system of feeding and rearing cattle is simplicity itself. The calves are given whole milk until about 5 weeks old, when the ration is gradually changed to skim milk and grain. The grain is cooked or steamed and fed with the milk at first, but when the calves are old enough the grain is fed dry immediately after giving the milk. When grass is available, it constitutes the entire ration for heifers, and during the winter the rations are only sufficient to keep them growing nicely.

Bulls are fed in the same manner until they are a year old, after which they are rather closely confined. Bulls used for breeding are kept in stables or paddocks. They are well fed, but are not allowed to become fat. Roots in winter and green forage in summer are largely used. Regular exercise is given.

FEEDING DAIRY COWS.

On the majority of the farms during summer the cows gather all their feed from the grass lots, although additional feed may be supplied when the grass supply runs short. Bran, cake, and oats are all used to some extent for this purpose, but the principal feed is the refuse from the gin distilleries, fed in open tubs in the grass lots.

This resembles brewers' grains and is relished by the animals. The amount fed per day varies from 30 to 70 pounds per cow, according to the condition of the grass.

In winter they use various kinds of home-grown roughage, roots, and a considerable amount of concentrated feed. Large quantities of hay and straw are used. The following rations are representative:

Farm No. 1.—This farm is located in the western part of Holland, near Alkmaar, and is considered to be one of the best in that locality. A large herd of very heavy-milking cows are maintained. The winter ration is clover hay, 20 pounds; oat straw, 6 pounds; mangels, 50 pounds; crushed oats, 3 pounds; corn, 3 pounds; wheat bran, 2 pounds; linseed cake, 2 pounds. The hay is fed in two feeds, morning and night, the straw at noon, the mangels in two equal feeds, after milking morning and night, the grain at milking times.

Ration for dairy cows fed in western Holland.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	
Clover hay	20	16.940	1.960	7.160	0.340	-----
Oat straw	6	5.448	.072	2.316	.048	-----
Mangels	50	4.550	.550	2.700	.050	-----
Crushed oats	3	2.670	.276	1.419	.128	-----
Corn meal	3	2.673	.237	2.001	.129	-----
Wheat bran	2	1.762	.244	.784	.054	-----
Linseed cake	2	1.816	.586	.654	.140	-----
-----		35.859	3.325	17.034	.887	1:5.72

Farm No. 2.—This farm is located in the northern part of Holland, near the town of Helder. The farm is not large, but is heavily stocked. The winter ration for cows in full milk is as follows: Mixed hay, 25 pounds; mangels, 40 pounds; crushed oats, 3 pounds; dried brewers' grains, 5 pounds; linseed cake, 2 pounds. The hay is fed in three feeds, morning, noon, and night; the roots in two feeds, after milking in the morning and about 5 o'clock in the evening, and the grain in two feeds, at milking time morning and evening.

Ration for dairy cows fed in northern Holland.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	
Mixed hay	25	21.775	1.475	10.225	0.300	-----
Mangels	40	3.640	.440	2.160	.040	-----
Crushed oats	3	2.670	.276	1.419	.128	-----
Dried brewers' grains	5	4.590	.785	1.815	.255	-----
Linseed cake	2	1.816	.586	.654	.140	-----
-----		34.491	3.562	16.273	.861	1:5.11

Farm No. 3.—This farm is located at Delft, near The Hague, in southwest Holland. The owner maintains a herd of 50 cows to supply the city milk trade. His winter rations are as follows: Clover hay, 15 pounds; mixed hay, 7 pounds; wet distillery grains, 40 pounds; corn meal, 3 pounds; wheat bran, 3 pounds; linseed cake, 2 pounds. The mixed hay is fed in the morning and the clover hay noon and night. The distillery grains are fed after milking morning and evening, and the grain ration at milking time morning and evening. The cows gave a large flow of milk but were in thin flesh at the time of the writer's visit.

Ration for dairy cows fed in southwestern Holland.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	
Clover hay	15	12.705	1.020	5.370	0.255	-----
Mixed hay	7	6.007	.413	2.863	.084	-----
Wet distillery grains	40	9.720	1.560	3.720	.560	-----
Corn meal	3	2.673	.237	2.001	.129	-----
Wheat bran	3	2.643	.366	1.176	.081	-----
Linseed cake	2	1.816	.586	.654	.140	-----
		35.654	4.182	15.784	1.249	1:4.45

CONDITIONS IN THE CHANNEL ISLANDS.

JERSEY.

That dairy farming can be conducted on very valuable land is amply illustrated on the island of Jersey. With land for agricultural purposes renting for from \$40 to \$80 per acre the people of this little island have been compelled to adopt a very intensified system of farming. The farms are small and the most important crop is early potatoes, which are grown for export. The live-stock interests are of but secondary importance. Were it not for the fact that animals are needed to aid in the fertilization of the soil and that they are very largely maintained on roots and soiling crops which are grown on the ground after the potatoes are harvested, it is more than likely that no live stock, except those needed for labor, would be maintained. Beef animals are not produced at all; sheep do not number 200 head altogether; horses are bred in very small numbers, the greatest portion of those required for labor being imported; and hogs are to be found on few farms. The Jersey cattle predominate almost to the exclusion of all others, yet they are not kept in sufficient numbers to supply the demands of the people for milk and butter. Butter is imported at all seasons of the year, and especially during the winter months. In former years, when it was the prevailing custom to have the cows calve in the spring of the year, sufficient butter was produced to supply the demand during the summer, but during the winter there was

a great shortage, which was always supplied by other countries. At present, with the cows calving at all seasons of the year, there is enough home-made butter to meet the demands of the higher classes of people, but the lower classes are compelled to use foreign butter throughout the entire year.

FEEDING BREEDING ANIMALS.

Care is used to avoid overfeeding of young animals. The amount of concentrated feed is limited, and much dependence is placed on roughage in winter, grass constituting the sole summer ration. Calves are usually on a ration of whole milk for the first three weeks of life, after which time it is gradually replaced by skim milk, and some farmers raise their calves on grass and skim milk. Others, however, give grain as well. Good results are reported from the use of rice at this time, some farmers feeding nothing but boiled-rice gruel. The best feeders boil 1 quart of rice in 2 gallons of water, which furnishes enough to add to the skim milk for two feeds for four calves of about 4 months old. If the rice has not been previously soaked, it is boiled ten hours, but if soaked for twelve hours it can be boiled sufficiently in one and a half hours. This is a cheap food and costs about $1\frac{1}{2}$ cents per pound.

Both bulls and heifers are fed in much the same way until 15 or 18 months of age, when the bulls are used for service and the heifers are bred. From this time on the heifers are more liberally fed, especially during the last three months of the gestation period.

As the majority of the farms are very small, and but few cows are kept on each farm, individual farmers do not keep bulls exclusively for their own use. The bulls as a rule are owned and maintained by a few of the larger farmers, who receive Government premiums for each bull of merit, provided that the services of such a sire can be had by the smaller farmers at a certain fee, which is always very reasonable. The subsidizing system has been adopted to raise the standard of the cattle on the island and has given very satisfactory results. On several of the farms visited two or three breeding bulls were seen. They are all maintained in very thin flesh. During the winter they are fed hay, roots (turnips, carrots, and mangels), and from 2 to 4 pounds of bran each per day. In the summer they are tethered on grass lots or soiled, with the same allowance of wheat bran. In some instances young bulls are given a small allowance of linseed cake, about $1\frac{1}{2}$ pounds per day, in addition to the bran ration.

FEEDING DAIRY COWS.

The Jersey cow in her native land is not so liberally fed as in other countries. In some instances the cows are wintered on the grass lot

with some straw and a few roots in addition only, but generally they receive better care. Roughage is fed in limited quantities, and a great deal of dependence is placed on the root crops to furnish the bulk of the winter rations. This is a cheap source of feed because they are grown as a second crop on the potato land. Turnips, swedes, carrots, and mangels are all grown. On some farms cabbages are grown for winter feeding. They are not so likely to impart an undesirable flavor to the milk as turnips, and are growing in public favor. Grain and cake are fed in very small quantities. The majority of farmers use from 2 to 5 pounds per cow per day, and it is said that only one farmer on the island feeds as much as 10 pounds to cows in full milk. During the summer no grain is fed as a rule. Great care is given cows at calving time; warm bran mashes are usually fed at this time. Bran mashes are frequently fed throughout the entire period of lactation, and on all farms the cows are grazed from four to seven hours each day throughout the winter. The freedom of the cattle from tuberculosis is emphatic evidence of the wisdom of this method of management.

The following rations are representative of those fed on the best farms, but must be considered as above the general average:

Farm No. 1.—This is a rather large farm in the parish of St. Saviours, where a good herd of milch cows are maintained from which many valuable animals have been exported to America. During the summer months the cows are tethered on a grass lot and receive no additional feed. During the fall, winter, and early spring months they are fed on hay, oat straw, roots, compound cake, wheat bran, and are on grass for six hours each day. They are fed seven times a day—at 5 a. m., $3\frac{1}{2}$ pounds of hay; 7 a. m., 30 pounds of roots; 9 a. m., 2 pounds compound cake and bran; from 10 a. m. to 4 p. m. on grass; 4.30 p. m., $3\frac{1}{2}$ pounds hay; 5.30 p. m., 30 pounds roots; 6.30 p. m., 2 pounds compound cake and bran, and at 8 p. m. 5 pounds of oat straw.

Ration for dairy cows fed in St. Saviours, island of Jersey.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	
Mixed hay.....	7	6.097	0.413	2.863	0.084	.....
Turnips.....	80	5.700	.600	4.320	.120	.....
Straw, oat.....	5	4.540	.060	1.930	.040	.....
Wheat bran.....	2	1.762	.244	.784	.054	.....
Compound cake.....	2	1.816	.540	.610	.170	.....
.....		19.915	1.857	10.507	.468	1:6.23

Farm No. 2.—This farm is located near St. Helier, and has one of the largest herds on the island. The methods of feeding are said to be much above the average. The summer rations consist of good grass and 2 pounds of cotton cake per cow per day. During the winter all feed is carefully prepared, the hay and straw being cut, the roots pulped, and the bran steamed. The feed is mixed together and allowed to stand for several hours before being fed. At 5 a. m. the cows are fed a mixture of cut hay, bran, and cotton cake, or gluten feed (the latter feed is liked very well, but can not be fed to advantage with large quantities of roots on account of its laxative nature); at 7.30 a. m., cut hay, cut straw, pulped roots, with some bran or crushed oats; at noon, another feed of the same mixture; from 1 p. m. until 5 p. m. they are tethered on a grass lot, and when brought into the stables are given a feed of the same mixture as at 5 a. m.; the last feed of the day is given at 7 p. m., and is the same as that given at 7 a. m. and noon.

Ration for dairy cows fed near St. Helier, island of Jersey.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	
Mixed hay.....	8	6.968	0.472	3.272	0.006	-----
Oat straw.....	4	3.632	.048	1.544	.032	-----
Carrots.....	40	4.500	.320	3.120	.080	-----
Wheat bran.....	2	1.762	.244	.784	.054	-----
Crushed oats.....	2	1.780	.184	.946	.084	-----
Cotton cake.....	2	1.936	.744	.336	.244	-----
	-----	20.638	2.012	10.002	.500	1:5.63

Farm No. 3.—This farm is located near Granville, and the owner is generally recognized as being the best feeder on the island. The herd numbers about one dozen cows, many of them with records of 17 pounds or more of butter in seven days. The summer ration consists of 3 pounds of cotton cake and good pasture grass for cows in full milk.

The winter ration consists of mixed hay, oat straw, roots (carrots until February and mangels during the remainder of the time), cabbages, compound cake, and wheat bran. At 5 a. m., 4 pounds of hay; 7.30 a. m., 25 pounds carrots; 9 a. m., 20 pounds cabbages; 9.30 a. m., 4 pounds cake and bran; from 10 a. m. until 4 p. m., on pasture; at 4 p. m., 4 pounds of hay; 5 p. m., 25 pounds carrots; 6 p. m., 4 pounds cake and bran; 8 p. m., 5 pounds of oat straw.

Ration for dairy cows fed near Granville, island of Jersey.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	
Mixed hay.....	8	6.968	0.472	3.272	0.086	-----
Oat straw.....	5	4.540	.060	1.930	.040	-----
Carrots.....	50	5.700	.400	3.900	.100	-----
Cabbages.....	20	3.060	.360	1.640	.080	-----
Compound cake.....	5	4.540	1.350	1.550	.425	-----
Wheat bran.....	3	2.643	.366	1.176	.081	-----
	-----	27.451	3.008	13.468	.822	1:5.00

On several other farms visited the same range of feeding stuffs was used as those mentioned. As a rule, the amounts of grain and cake fed were not so large, while in many instances the amount of roots given was greater.

GUERNSEY.

Although the island of Guernsey is located quite near the island of Jersey, the conditions prevailing are quite different in many respects. Land rents are not so high in Guernsey, but from the standpoint of live-stock production this has not proved to be an advantage. The live-stock interests are confined almost solely to the Guernsey breed of cattle and are of secondary importance from an agricultural standpoint. The production of tomatoes, grapes, and bulbs, under glass, occupies the first attention of the people, and live stock are maintained largely because of their favorable influence on the fertility of the land. Like the farmers of Jersey, the breeders of Guernsey do not give their cattle as good care and feed as those in countries where the production of dairy and meat products is more important. However, the methods of feeding are very good on many farms. A system of feeding which has a slight tendency to produce flesh is appreciated rather than otherwise. With this exception, however, the methods of feeding are very much the same as in the island of Jersey.

Grass, soiling crops, and roots supply the succulent feed. Mangels, turnips, and carrots are the common roots, but parsnips are also fed and are particularly valuable as they do not taint the milk. The amount of roughage used is larger than in Jersey.

FEEDING BREEDING STOCK.

Calves are generally fed more liberally than in Jersey. They are usually fed some grain and roots after the whole milk is discontinued. Bulls and heifer calves are fed alike.

Mature bulls are not maintained in high flesh, some breeders believing that high feeding tends to make a bull vicious. During the summer mild-tempered bulls are tethered on grass, but vicious ones are confined to the stables. Additional feed may be given the bulls on grass. During the winter one good breeder feeds his mature bulls on 10 pounds of mixed hay, 5 pounds of oat straw, 60 pounds of roots, and 3 pounds of wheat bran.

FEEDING DAIRY COWS.

The methods of feeding the milch cows are very much the same as those prevailing in Jersey, the chief difference being the larger use of hay and turnips in winter, the use of parsnips, and the greater attention given to the use of soiling crops for spring and early summer feeding. Methods of management are also very similar.

The following are representative winter rations, but on many of the smaller farms more roots and less grain and cake are given:

Farm No. 1.—This is a medium-sized farm near St. Martins on which about a dozen high-class cows are maintained. During the spring and summer the cows are tethered on grass and on such crops as oats and vetches. In addition they receive about 2 pounds of cotton-seed cake and 2 pounds of bran each per day. During the winter they are fed 15 pounds of mixed hay, 50 pounds of roots (parsnips and mangels), and about 8 pounds of bran per cow per day in addition to pasture.

Ration for dairy cows fed near St. Martins, island of Guernsey.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	
Mixed hay	15	13.065	0.885	6.135	0.180	.....
Parsnips	50	5.850	.800	5.600	.100	.....
Wheat bran	8	7.048	.976	3.136	.216	.....
	.....	25.963	2.661	14.871	.496	1 : 6.01

Farm No. 2.—This is a large farm located near Catel, on which about 60 cows are maintained, including many of the most famous show-yard and butter-test winners at the leading island and English shows.

During the summer the cows receive about 2 pounds of bran and 1 pound of cake each, in addition to grass, those being fitted for exhibition receiving more, in some instances as high as 3 pounds of cake and 5 pounds of warm bran mash. The winter rations consist of about 14 pounds of mixed hay, 3 pounds of oat straw, 3 pounds of cotton-seed cake, 5 pounds of bran in the form of a warm mash,

and 50 pounds of carrots or mangels per cow per day, in addition having several hours each fine day on a grass lot. At the time of the writer's visit the cows were in good condition and giving very satisfactory returns.

Ration for dairy cows fed near Catel, island of Guernsey.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	
Mixed hay	14	12.194	0.826	5.726	0.168	-----
Oat straw	3	2.724	.036	1.158	.024	-----
Mangels	50	4.550	.550	2.700	.050	-----
Cotton-seed cake	3	2.754	1.116	.507	.366	-----
Wheat bran	5	4.405	.610	1.960	.135	-----
	-----	26.627	3.138	12.051	.743	1:4.87

DAIRY FEEDING IN FRANCE.

French farmers, especially in the northern and central sections, are engaged more or less in milk production, and the feeding of the dairy cow has received considerable attention. While the chief aim is to produce the largest possible flow of milk from a given amount of feed, in some districts much attention is given to the effect of feed on the milk. For instance, some farmers feed cocoanut meal with the hope of improving the flavor and texture of butter.

During summer some of the best farmers graze the cows the entire time, giving no additional feed except in times of continued dry weather or overstocking, when a small allowance of cotton-seed meal or wheat bran may be given, the amount varying from 2 to 6 pounds per cow daily. Some farmers use green forage instead of grain.

Where the land is very valuable and fences are considered wasteful, the cows are fed in a stable and soiled during summer or tethered on grass.

In winter the general tendency is to feed rather heavily on roughage and sparingly on concentrates. As a rule fully two-thirds of the dry matter of the ration is obtained from the roughage.

The following are fairly representative winter rations:

Farm No. 1.—This is a medium-sized farm in Normandy where about 30 cows are milked. The roughage is home-grown; in fact, all of the ration, with the exception of the bran and linseed cake, is produced on the farm. Ration: Alfalfa hay, 22 pounds; ground barley, 3 pounds; crushed oats, 3 pounds; wheat bran, 2 pounds; linseed cake, 1 pound; fodder beets, 20 pounds. The hay is fed in three feeds, morning, noon, and night; the grain in two feeds—at milking time, morning and night, and the beets about 4 o'clock in the afternoon.

Ration for dairy cows fed in Normandy, France.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	
Alfalfa	22	20.152	2.420	8.712	0.264	-----
Fodder beets	20	1.820	.220	1.080	.020	-----
Ground barley	3	2.673	.261	1.968	.048	-----
Crushed oats	3	2.670	.276	1.419	.126	-----
Wheat bran	2	1.762	.244	.784	.054	-----
Linseed cake	1	.908	.293	.327	.070	-----
	-----	29.985	3.714	14.290	.582	1 : 4.19

Farm No. 2.—This is a rather small dairy farm located in French Flanders, a noted dairy district. Although the farm contains but 80 acres, the owner maintains a herd of 30 milch cows in addition to young cattle and other classes of stock. Ration: Clover hay, 12 pounds; oat straw, 6 pounds; dried brewers' grains, 6 pounds; crushed oats, 3 pounds; wheat bran, 2 pounds; cotton-seed cake, 2 pounds. The hay and straw are chaffed. In the evening the hay, straw, and grain to be used the following day are mixed together and moistened. The mixture is allowed to stand overnight, and before feeding the next day is scalded with boiling water. It is fed in three feeds, the largest amount being given at night. However, the preparation of the feed involves a great deal of labor, and the owner frankly admits that he would abandon steaming at least if he had succulent feed.

Ration for dairy cows fed in French Flanders.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	
Clover hay	12	10.164	0.816	4.296	0.204	-----
Oat straw	6	5.448	.072	2.316	.048	-----
Dried brewers' grains	6	5.508	.942	2.178	.306	-----
Crushed oats	3	2.670	.276	1.419	.126	-----
Wheat bran	2	1.762	.244	.784	.054	-----
Cotton-seed cake	2	1.836	.744	.338	.244	-----
	-----	27.388	3.064	11.331	.982	1 : 4.38

Farm No. 3.—This is a medium-sized dairy farm, located in southern Brittany and stocked with an excellent herd of the small black-and-white Brittany cows. The milk is sold to supply a city milk trade, and a uniform flow throughout the winter is desirable.

The following ration is fed: Alfalfa, 15 pounds; mixed hay, 5 pounds; corn meal, 3 pounds; crushed oats, 3 pounds; wheat bran,

2 pounds; and cotton-seed cake, 2 pounds. The grain is fed in two feeds—at milking time morning and evening, the mixed hay at noon, and the alfalfa morning and night.

Ration for dairy cows fed in Brittany, France.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	
Alfalfa	15	13.740	1.650	5.940	0.180	-----
Mixed hay	5	4.355	.285	2.045	.060	-----
Corn meal	3	2.673	.237	2.001	.129	-----
Crushed oats	3	2.670	.276	1.419	.126	-----
Wheat bran	2	1.762	.244	.784	.054	-----
Cotton-seed cake	2	1.836	.744	.338	.244	-----
-----		27.086	3.446	12.527	.793	1 : 4.15

DAIRY METHODS IN AUSTRIA-HUNGARY.

Most of the milk used in Austria-Hungary is produced on the farms of the more fertile sections, where farmers keep but a few milch cows and do not follow dairying as a specialty. However, near large cities there are persons who are engaged exclusively in dairy farming. It is not common to graze dairy cows and the practice is limited almost entirely to the hilly districts, where small, productive valleys are surrounded by highland which is only suitable for grazing. When cows are stabled they are soiled during the summer.

Summer rations.—On the majority of farms the summer rations consist of from 50 to 80 pounds of green fodder per cow per day, and from 5 to 10 pounds each of grain.

The following rations will convey a fairly good idea of the methods of summer feeding:

Farm No. 1.—Alfalfa, 60 pounds; corn, 3 pounds; crushed oats, 3 pounds; wheat bran, 2 pounds.

Farm No. 2.—Green corn, 30 pounds; green clover, 20 pounds; green oats, 20 pounds; corn meal, 3 pounds; mill feed, 2 pounds; and wheat bran, 2 pounds.

Farm No. 3.—Alfalfa, 70 pounds, fed in three feeds—two of 20 and one of 30 pounds. The owner had previously been feeding some grain, but, deciding it was not profitable, stopped the grain and increased the alfalfa. According to his statement his cows give just as much milk on alfalfa alone as when fed alfalfa and grain, and the daily ration is about 4½ cents per cow cheaper.

Winter rations.—During the winter most farmers feed three times per day, but there is a growing sentiment in favor of feeding but

twice per day. All grain is crushed or ground before feeding; the roughage is usually fed long, without moistening or steaming.

Farm No. 1.—Alfalfa hay, 20 pounds; corn fodder, 10 pounds; corn meal, 3 pounds; crushed oats, 3 pounds, and wheat bran, 1 pound. The alfalfa is fed morning and evening, about 8 or 12 pounds, respectively, the corn fodder at noon, and the concentrated feed in two equal feeds, morning and evening. In this instance all of the feed, with the exception of the wheat bran, is home-grown and the ration is not considered expensive.

Ration for dairy cows fed in Austria-Hungary (farm No. 1).

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	
Alfalfa hay	20	18.32	2.2	7.92	0.24	-----
Corn fodder	10	5.78	.25	3.46	.12	-----
Corn meal	3	2.673	.237	2.001	.129	-----
Crushed oats	3	2.670	.276	1.419	.126	-----
Wheat bran	1	.881	.122	.392	.027	-----
	-----	30.324	3.085	15.192	.642	1:5.39

Nearly four-fifths of the dry matter and protein in this ration is obtained from the roughage. It has many features which should commend it to American farmers, particularly in the alfalfa-growing districts.

Farm No. 2.—This is a rather small farm near a large city, where the owner aims to keep one cow for each acre of land. Clover hay 16 pounds, oat straw 7 pounds, crushed oats 3 pounds, wheat bran 3 pounds, and linseed cake 2 pounds constitute the ration. The clover hay is fed in equal feeds, morning and evening, the oat straw at noon, and the concentrated feed in equal feeds morning and night. This ration gives very good results. It differs from the foregoing one in that the two principal sources of protein, wheat bran and oil cake, are purchased.

Ration for dairy cows fed in Austria-Hungary (farm No. 2).

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	
Clover hay	16	13.552	1.088	5.728	0.272	-----
Oat straw	7	6.356	.084	2.702	.056	-----
Crushed oats	3	2.670	.276	1.419	.126	-----
Wheat bran	3	2.643	.366	1.176	.081	-----
Linseed cake	2	1.816	.586	.654	.140	-----
	-----	27.037	2.400	11.679	.675	-----

Farm No. 3.—Alfalfa hay, 10 pounds; clover hay, 8 pounds; corn fodder, 10 pounds; crushed oats, 3 pounds; and corn meal, 3 pounds. The clover hay is fed in the morning, the corn fodder at noon, and the alfalfa hay at night. The grain is fed in one feed about 5 o'clock in the evening.

Ration for dairy cows fed in Austria-Hungary (farm No. 3).

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	
Alfalfa hay.....	10	9.16	1.10	3.96	0.12	-----
Clover.....	8	6.776	.544	2.864	.136	-----
Corn fodder.....	10	5.78	.25	3.46	.12	-----
Corn meal.....	3	2.673	.237	2.001	.129	-----
Crushed oats.....	3	2.670	.276	1.419	.126	-----
	-----	27.059	2.407	13.704	.631	1:6.28

DAIRYING IN GERMANY.

Dairying is easily the most important branch of the cattle industry in Germany, especially in the northern and western portions, where the influence of the Danish and Dutch farmers has been felt. The milk produced supplies creameries and cheese factories, condensed-milk factories, and the city milk trade, and a large amount of butter and cheese is made on the farms where the cows are kept. Some farms are rather heavily stocked, but usually only a small number of cows are kept on each farm. Practical men appear to give little thought to the preparation of rations or methods of feeding. With the exception of linseed and cotton-seed cake, practically all of the feed used is home grown or the by-products of home manufactures, such as sugar production and brewing.

Farm No. 1.—This farm is located in the northern part of Germany. Summer ration: Green clover, in season, 70 pounds; dried brewers' grains, 5 pounds, and linseed cake, 2 pounds.^a At other times from 60 to 80 pounds of a mixture of oats and barley or peas, oats, and barley, with the same grain allowance, are fed. During the early fall about 30 pounds of sugar beets per cow daily are fed instead of part of the forage.

The winter ration is composed of clover hay, 20 pounds; oat hay, 8 pounds; corn meal, 3 pounds; dried brewers' grains, 3 pounds, and linseed cake, 2 pounds. The clover hay is fed in two feeds, morning and night; the oats hay, which is made by cutting oats about ten days before being ripe, is fed at noon. The grain is fed in two equal feeds—morning and night.

^a On some farms cotton-seed cake is fed in summer instead of linseed cake.

Ration for dairy cows fed in northern Germany.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	
Clover hay	20	16.940	1.860	7.160	0.340	-----
Oat hay	8	7.288	.344	3.712	.120	-----
Corn meal	3	2.673	.237	2.001	.129	-----
Dried brewers' grains	3	2.754	.471	1.089	.153	-----
Linseed cake	2	1.816	.586	.654	.140	-----
	-----	31.471	2.998	14.616	.882	1:5.54

Farm No. 2.—This farm is located near the city of Munich, and the owner uses large quantities of wet brewers' grains. Summer ration: At the time of the writer's visit the farmer was feeding 40 pounds of green alfalfa and about 60 pounds of wet brewers' grains per cow daily. The brewers' grains were fed early in the morning and about 5 o'clock in the evening. The mangers were cleaned out before each feeding time, to remove anything which might have been left over from the previous feed.

The cows were rather thin and their bowels very loose, but aside from this they showed every indication of thrift and health.

The winter ration on this farm is simple. It is composed of alfalfa hay, 16 pounds; wet brewers' grains, 40 pounds, and corn meal, 3 pounds. The alfalfa is fed in two equal feeds, immediately after milking morning and evening, the brewers' grains in two feeds, early in the morning and about 5 o'clock in the evening, and the corn meal at midday.

Ration for dairy cows fed near Munich, Germany.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	
Alfalfa hay	16	14.656	1.760	6.336	0.192	-----
Wet brewers' grains	40	9.720	1.560	3.720	.560	-----
Corn meal	3	2.673	.237	2.001	.129	-----
	-----	27.049	3.557	12.057	.881	1:3.95

Farm No. 3.—This farm is located near Berlin and the milk is sold to supply the city trade. The cows are stabled throughout the entire year and allowed out of doors only for a few hours each day in an open yard. At the time of the writer's visit, during the latter part of July, the ration was composed of alfalfa about 30 pounds, green peas, oats, and barley about 40 pounds, and a grain mixture

of 2 pounds wheat bran, 2 pounds corn meal, and 2 pounds cotton-seed cake.

Being near a sugar factory, the owner uses a great deal of beet pulp during the early winter. The following ration has been used with satisfactory results: Beet pulp, 80 pounds; alfalfa hay, 10 pounds; clover hay, 5 pounds; corn meal, 3 pounds; wheat bran, 2 pounds; and cotton-seed cake, 2 pounds. The beet pulp was fed in two feeds, in the early morning and before milking in the evening, the grain about 10 o'clock, the clover hay at 1 o'clock, and the alfalfa hay after milking.

Ration for dairy cows fed near Berlin, Germany.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	
Beet pulp.....	80	8.160	0.480	5.840	-----	-----
Alfalfa	10	9.160	1.100	3.960	0.120	-----
Clover hay	5	4.235	.340	1.790	.085	-----
Corn meal	3	2.673	.237	2.001	.129	-----
Wheat bran	2	1.762	.244	.784	.054	-----
Cotton-seed cake.....	2	1.836	.744	.338	.244	-----
	-----	27.826	3.145	14.713	.632	1:5.13

SWISS DAIRY METHODS.

The best and most profitable dairy farming in Switzerland is to be found in the more fertile districts of Zurich, Zug, Lucerne, and Schwytz. Here the land is considered too valuable for grazing, and all animals not in milk are sent to the mountains to graze during the summer. The milch cows are soiled or tethered on grass or forage lots during the summer and are maintained very simply during the winter. In winter hay may constitute the entire ration, and it is usually given in three feeds. Some feeders use a small amount of concentrated feed in addition to the roughage, or it is sometimes substituted for a small amount of roughage.

On one of the best farms visited the owner feeds the following ration during the winter: Morning, 8 pounds clover hay; noon, 6 pounds mixed hay; 5 o'clock, 3 pounds linseed cake, and at night, 14 pounds alfalfa.

Ration for dairy cows fed in Switzerland.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	
Clover hay	8	6.776	0.544	2.864	0.136	-----
Meadow hay	6	5.226	.354	2.454	.072	-----
Alfalfa hay	14	12.824	1.54	5.544	.132	-----
Linseed cake	3	2.724	.879	.981	.21	-----
	-----	27.550	3.317	11.843	.550	1 : 3.94

On another farm the following winter ration is fed: Morning, 8 pounds clover hay; noon, 8 pounds clover hay; 6 o'clock, 2 pounds peanut meal, and at night, 12 pounds clover hay.

Another ration for dairy cows fed in Switzerland.

Feeding stuff.	Quantity.	Dry matter.	Digestible protein.	Digestible carbohydrates.	Digestible fat.	Nutritive ratio.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	
Clover hay	28	23.716	1.904	10.024	0.476	-----
Peanut meal	2	1.786	.858	.456	.138	-----
	-----	25.502	2.762	10.480	.614	1 : 4.29